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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/574,878	02/06/2007	Sylvie Dubois	034299-691	5441

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EXAMINER

HOOVER, MATTHEW

ART UNIT	PAPER NUMBER
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4122

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/574,878	Applicant(s) DUBOIS ET AL.	
	Examiner MATTHEW HOOVER	Art Unit 4122	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>7/13/06</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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4. Claims 1, 4-14 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bauer et al (US 5841200) in view of Caranoni et al (US 7309473 B2).

Regarding claim 1, Bauer teaches a process for producing nuclear pellets that uses mixed uranium oxide and plutonium oxide, having a specific plutonium content (abstract). The first step in the process is to dose a first mixture of UO_2 and PuO_2 powders with plutonium content above the specified content. The mixture is then milled (column 3 lines 14-18). The next step is to screen this mixture (column 3 line 19). The next step is to add additional UO_2 powder to the first mixture to create a second mixture having the specified plutonium content (column 3 lines 22-24). The mixture then gets pelleted and sintered (column 3 lines 26-29). Regarding claim 11, it teaches that the plutonium content of the first stage/primary mixture is between 25-30 weight percent (column 4 lines 36-50). Regarding claim 12, it teaches that the PuO_2 content of the final mixture is 6 weight % (column 7 lines 62-67 and column 8 lines 1-6). Regarding claim 13, it teaches that chamotte can be added to a mixture of UO_2 and PuO_2 (column 6 lines 12-13). Regarding claim 14, it teaches that lubrication is done after the mixing of the second mixture (figure 3) and the lubrication is done with lubricating agents such as calcium or zinc stearate (column 6 lines 54-56). Regarding claims 15 and 16, it teaches that sintering occurs at a temperature between 1650-1750 C in a reducing gas atmosphere, wherein the atmosphere is a hydrogen-argon mixture containing 5-7% hydrogen and the water content is 2500ppm (column 7 lines 18-21, column 8 lines 7-13). It also teaches that the gaseous atmosphere has an O/M ratio very close to 2.00 (column 7 lines 21-24).

Bauer however, does not teach that a compound chosen from the group of oxides of chromium, aluminum, titanium, magnesium, vanadium and niobium, precursors thereof and inorganic compounds capable of providing sulfur during the sintering process are added to the uranium oxide, the plutonium oxide, or the combined mixture thereof. Bauer does not teach that the compound added is an inorganic compound capable of providing the element of sulfur during sintering and is added either to the primary or final mixture in powdered form. Bauer also does not disclose the mass content of elementary sulfur in the final mixture. It does not disclose that the inorganic compound is uranium oxysulphide or the mass content of uranium oxysulphide in the final mixture. Bauer does not discuss the oxygen potential at the sintering temperature.

Regarding claims 1 and 6, Caranoni teaches that the combined mixture of UO_2 and PuO_2 undergoes a sulphidation treatment that causes the production of the compound uranium oxysulphide in the mixture. The compound is inorganic and capable of providing sulfur during sintering (column 10 lines 54-67 and column 6 lines 59-67). Regarding claim 4, Caranoni teaches that the combined mixture of UO_2 and PuO_2 undergoes a sulphidation treatment that causes the production of the compound uranium oxysulphide in the mixture. The compound is inorganic and capable of providing sulfur during sintering (column 10 lines 54-67 and column 6 lines 59-67). Regarding claim 5, the level of sulfur in the final mixture that is subjected to pelleting and sintering is generally from 100ppm and 1000ppm (column 5 lines 18-21). Regarding claim 7, the level of UOS in the final mixture in one example was found to be 2413ppm

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(column 11 lines 29-36). Regarding claims 8 and 9, Caranoni teaches that the compound UOS can be added to the primary or final mixture of uranium dioxide and plutonium dioxide before being undergoing pelleting (primary-column 10, lines 14-40, final-column 11 lines 59-67 and column 12 lines 1-6). Regarding claim 10, Caranoni teaches that the UO_2 and PuO_2 mixture undergoes sulphidation and remains in powdered form. Therefore, the inorganic compound capable of providing sulfur must be in powdered form as well (abstract).

It would be obvious to combine these two references because they both involve the production of nuclear fuel pellets using uranium and plutonium oxides. They also discuss almost identical procedures for producing the pellets. The motivation for combining is discussed in Caranoni, where it discloses that sintered nuclear fuel pellets can be made with improved properties with regard to the microstructure of the pellets with, in particular, an increase in the size of the particles of material by adding sulfur to the invention. Also Bauer teaches the use of a solid, organic, sulphur product of the zwitterion type in the early stages of the process (abstract) and Caranoni details a process using a specific sulphur compound. Furthermore, for claim 5, Caranoni discloses a range in the prior art that falls within the range of the claim (column 5 lines 18-21). Regarding claim 7, Caranoni discloses the ppm of the final mixture of sulfur to be 270 ppm (column 11 line 33). Since all of the sulfur of the final mixture comes from UOS a simple conversion can be made to find the ppm of UOS. The mass content of UOS was found to be around 2413 ppm. Regarding claims 8 and 9, Caranoni discloses process of adding UOS to the mixture. The prior art discloses a process of adding the

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UOS through a sulphidation treatment. The examiner asserts that there is no difference in adding the UOS directly and using the sulphidation treatment to add the compound. The addition of this compound to the primary or final mixture as disclosed in Bauer does not change the overall process or end product. This change in sequence in adding ingredients is not patentable under *In re Gibson*, 39 F.2d 975, 5 USPQ 230 (CCPA 1930). Regarding claim 12, it is common knowledge that plutonium has a much larger atomic mass than oxygen, 244 compared to 16. Therefore, if the mass percentage of plutonium oxide is 6% in the final mixture, the mass percent of plutonium would be only slightly less than this at around 5.3%. Regarding claim 17, Bauer discloses a process for the production of nuclear fuel pellets that produces a pellet of nuclear fuel based on uranium and plutonium (abstract, column 3, lines 14-29). The prior art discloses a product which reasonably appears to be either identical with or only slightly different than a product claimed in a product-by-process claim, a rejection is acceptable. See *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972).

5. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bauer et al (US 5841200) in view of Caranoni et al (US 7309473 B2) and The Journal of Nuclear Materials, Oxygen potential and thermal conductivity of (U, Pu) mixed oxides, by P.R. Vasudeva Rao, Volume 348, Issue 3 pages 329-334.

Bauer and Caranoni have been discussed above.

Rao, Volume 348, Issue 3 states that the oxygen potential range of an O/M ratio of 1.96 to 2.00 is between -550 and -300 KJ/mol (abstract). The measurements were done at temperatures between 1200C and 1500C.

The Journal of Nuclear Materials and the Bauer and Caranoni references can be combined. The motivation is that both references discuss the same process done to the same plutonium and uranium oxides. Therefore, whatever properties exhibited Rao (such as oxygen potential) would be expected to be the same as those displayed in Bauer. Further motivation would be that Rao discloses a conversion of O/M ratio to oxygen potential at a given temperature. This would have been an expected chemical property of the substance and would be the same as those listed in Bauer. The conversion in Rao shows that the oxygen potential in Bauer falls within those of the claim. Also, the temperature values tested in Rao were not of the values in Bauer. However, they are close enough that their results can be expected to have the same properties. .

6. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bauer et al (US 5841200) further in view of Gradel et al (US 2002/0149125).

Bauer teaches a process for producing nuclear pellets that uses mixed uranium oxide and plutonium oxide, having a specific plutonium content (abstract). The first step in the process is to dose a first mixture of UO_2 and PuO_2 powders with plutonium content above the specified content. The mixture is then milled (column 3 lines 14-18). The next step is to screen this mixture (column 3 line 19). The next step is to add

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additional UO_2 powder to the first mixture to create a second mixture having the specified plutonium content (column 3 lines 22-24). The mixture then gets pelleted and sintered (column 3 lines 26-29).

Bauer does not teach chromium sesquioxide or a precursor thereof is added to the uranium oxide, the plutonium oxide, or the combined mixture thereof. It also does not teach the mass content of Cr_2O_3 in the final mixture.

Gradel teaches that Cr_2O_3 can be added to a nuclear fuel pellet in the amount of 1000-3000ppm (page 2, column 1, paragraph 12).

It would be obvious to one of ordinary skill in the art to combine these references because they both discuss the process of making nuclear fuel pellets using uranium dioxide and plutonium dioxide. They both also have very similar process steps and ingredients. The motivation for combining would be to improve the fission gas retention and PCI properties as well as accelerate grain growth during sintering. This is done by adding Cr_2O_3 (Gradel page 2 paragraph 12). Although Gradel does not disclose when the Cr_2O_3 is added to the mixture so one could assume that it is added to the final mixture right before pelleting and sintering, which would make its mass content fall within that of the claimed value.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure is Gotta (US 6984334, similar procedure for nuclear pellets) and Zawidzki (US 4314952, using sulfur in nuclear pellets).

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW HOOVER whose telephone number is (571)270-7663. The examiner can normally be reached on Monday-Friday, 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano can be reached on (571)272-1398. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MH/
Patent Examiner AU4122

/Milton I. Cano/
Supervisory Patent Examiner, Art Unit 4122